THE TECHNOLOGY ADVANTAGE

6 December 2018 18:30 - 20:00
Bug Room, COP24 official side event

Next generation technologies to tackle climate challenges in agriculture

Organizing Partners

CGIAR RESEARCH PROGRAM ON Climate Change, Agriculture and Food Security CCAFS

CIP INTERNATIONAL POTATO CENTER A CGIAR RESEARCH CENTER

CGIAR RESEARCH PROGRAM ON Roots, Tubers and Bananas

ICARDA Science for resilient livelihoods in dry areas

WORLD ECONOMIC FORUM COMMITTED TO IMPROVING THE STATE OF THE WORLD

Next generation root, tuber and banana crops: raising the bar for heat, drought, and emerging diseases

Graham Thiele, Michael Friedmann and Hugo Campos

Our crops






Banana Plantain	Cassava	Potato	Sweetpotato	Yam	Other R&T

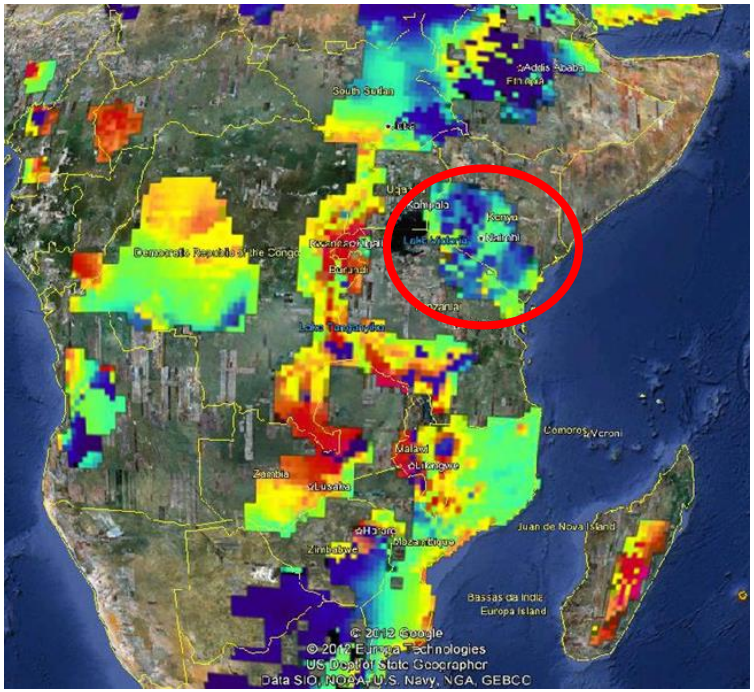
300 million small holder farmers , their families and processors depend on RTB crops

buffering role in food systems

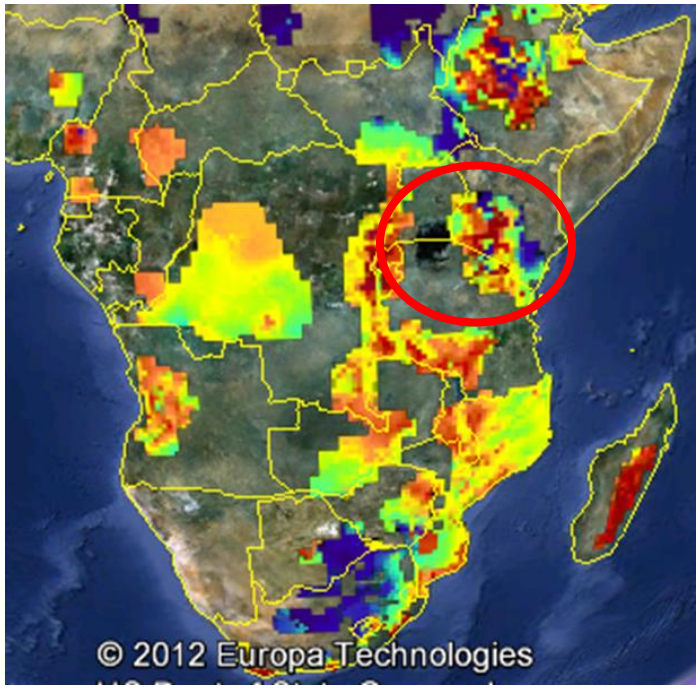
Climate smart breeding

1. Climate change so fast that current technology wont be able to keep up!
2. Looking into the future: climate change drivers of yield loss
3. Key traits and levels to respond to drivers
4. Now: selecting climate smart varieties
5. Keeping ahead of curve: genomic research, gene editing, precision phenotyping to design-in climate responsive traits whilst meeting complex user needs
6. Embed in climate smart management, seed and food systems

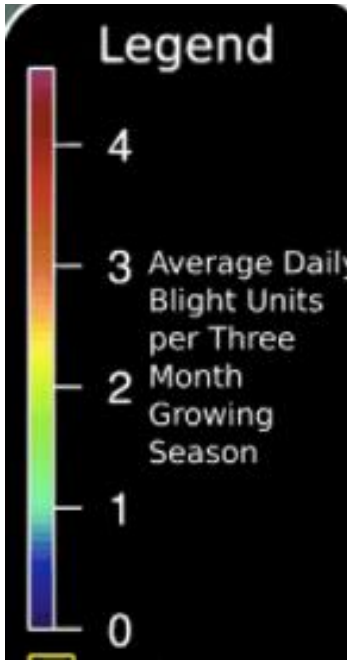
Climate change: pests and diseases



LB severity—current



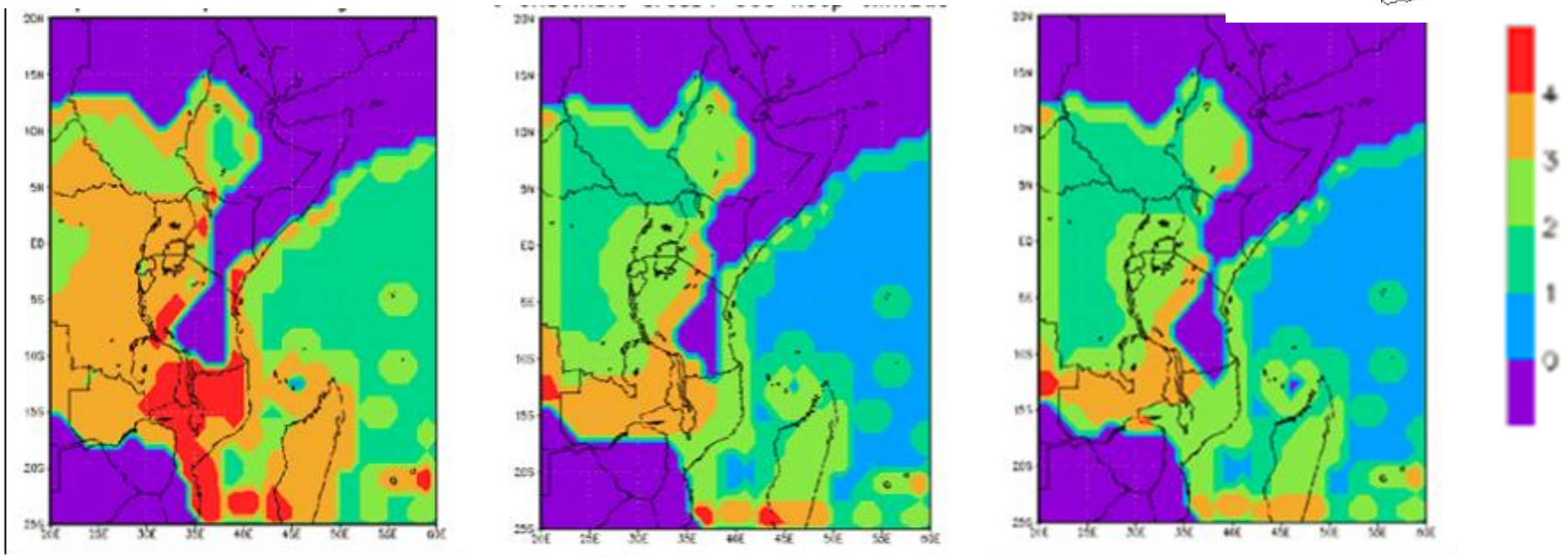
LB severity—2050



Legend

Figure 5. Predictions of potato late blight severity in sub-Saharan Africa using a metamodel (source: Sparks et a 2014).

Climate change impacts: heat and drought in East Africa - sweetpotato



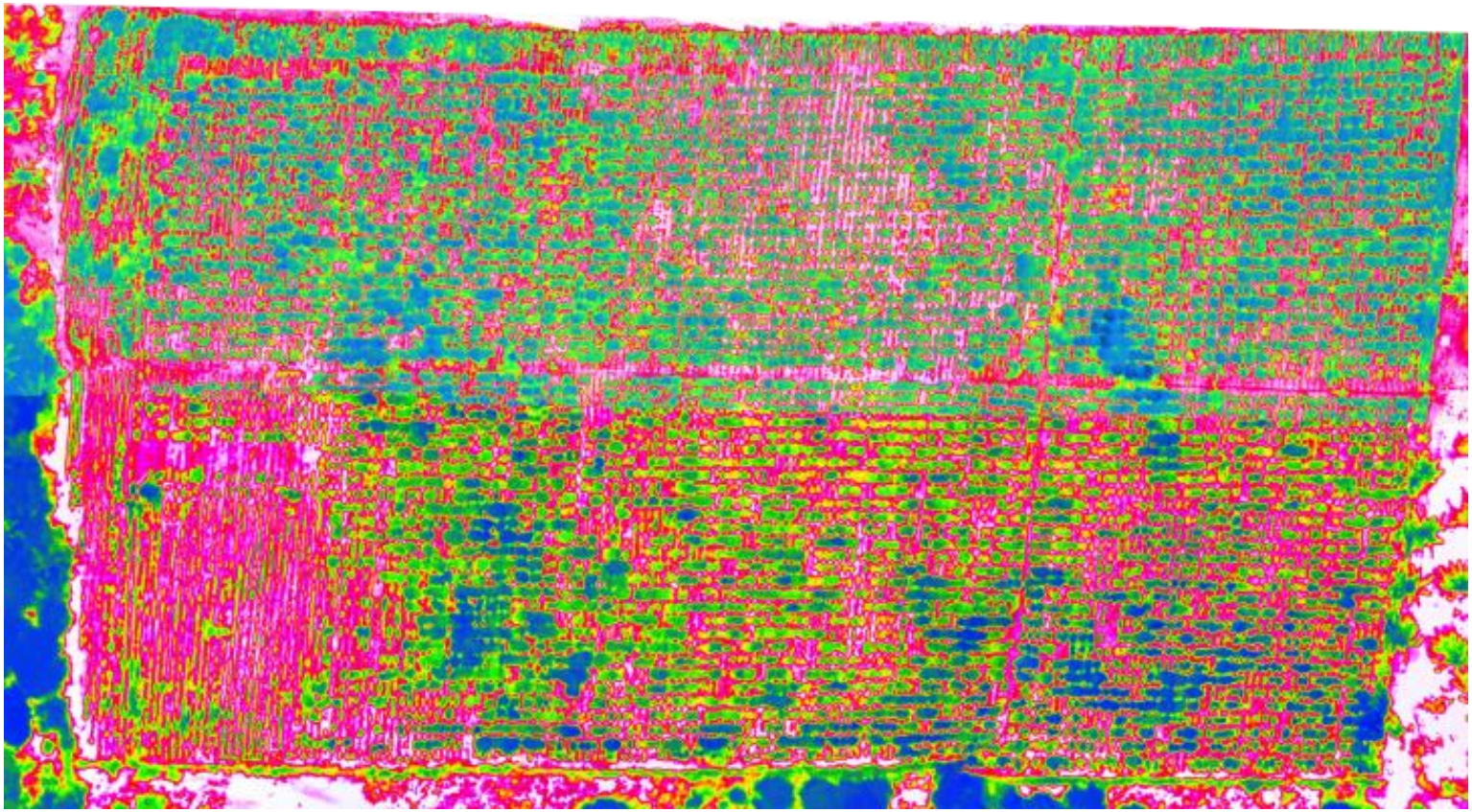
Current 2050 2090 Legend

Figure 4. Suitability of sweetpotato cultivation in East Africa under high emissions scenario (source: Washington et al. 2012. Ensemble sresb1 JAPRE Climatic Growth Area). Scale: 0 = unadapted, 4 = optimally adapted.

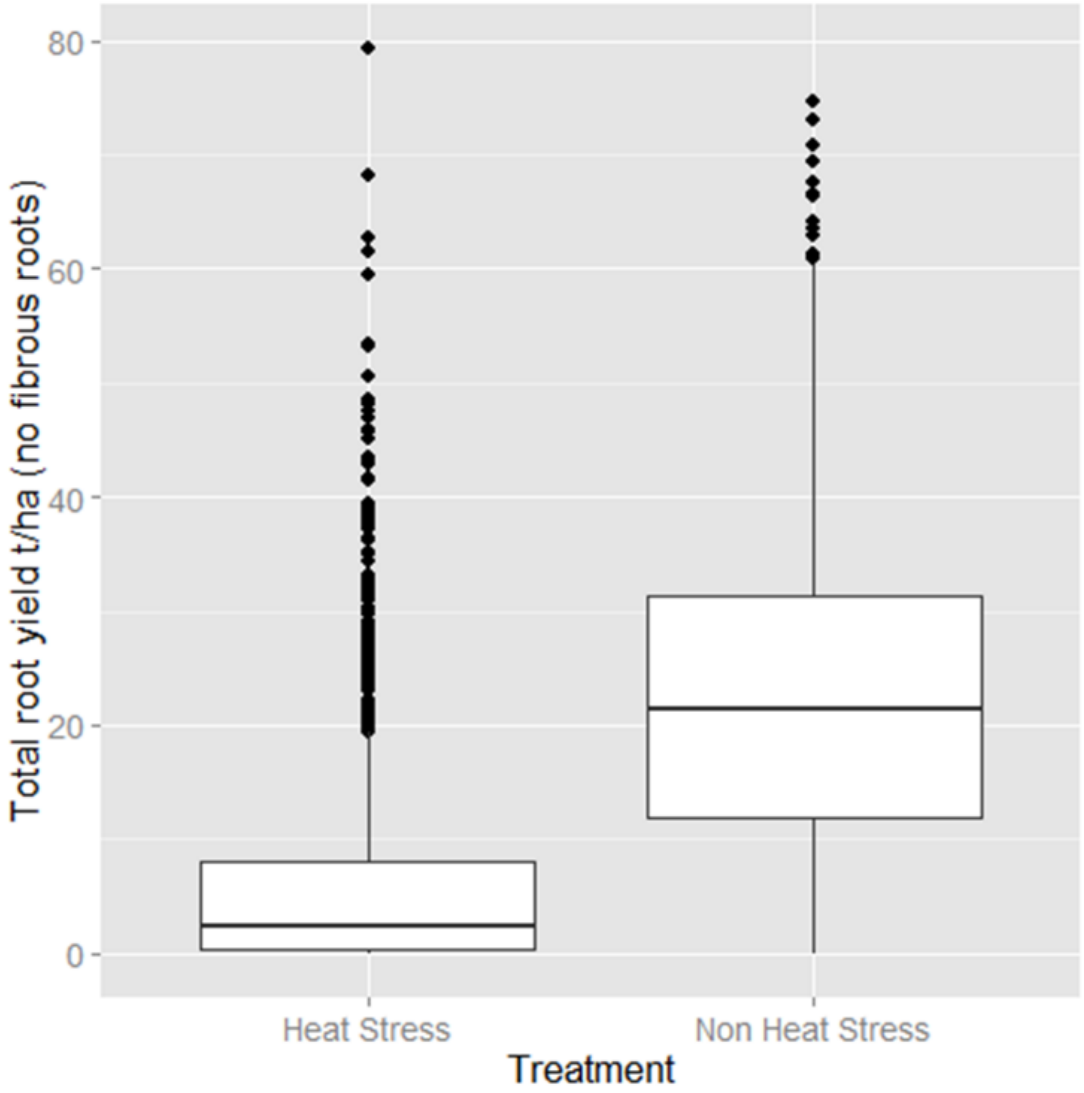
Screening sweetpotato for heat tolerance N. Peru: Min Soil temp 24 °C no heat stress vs 30 °C

Experimental site in Piura
1973 accessions from CIP genebank:
Heat tolerance, early bulking yield

Yield of storage roots vs. pencil roots represent an indicator for heat tolerance



Thermographic image: field in summer 2014 - heat stress exposure at maximum storage root bulking



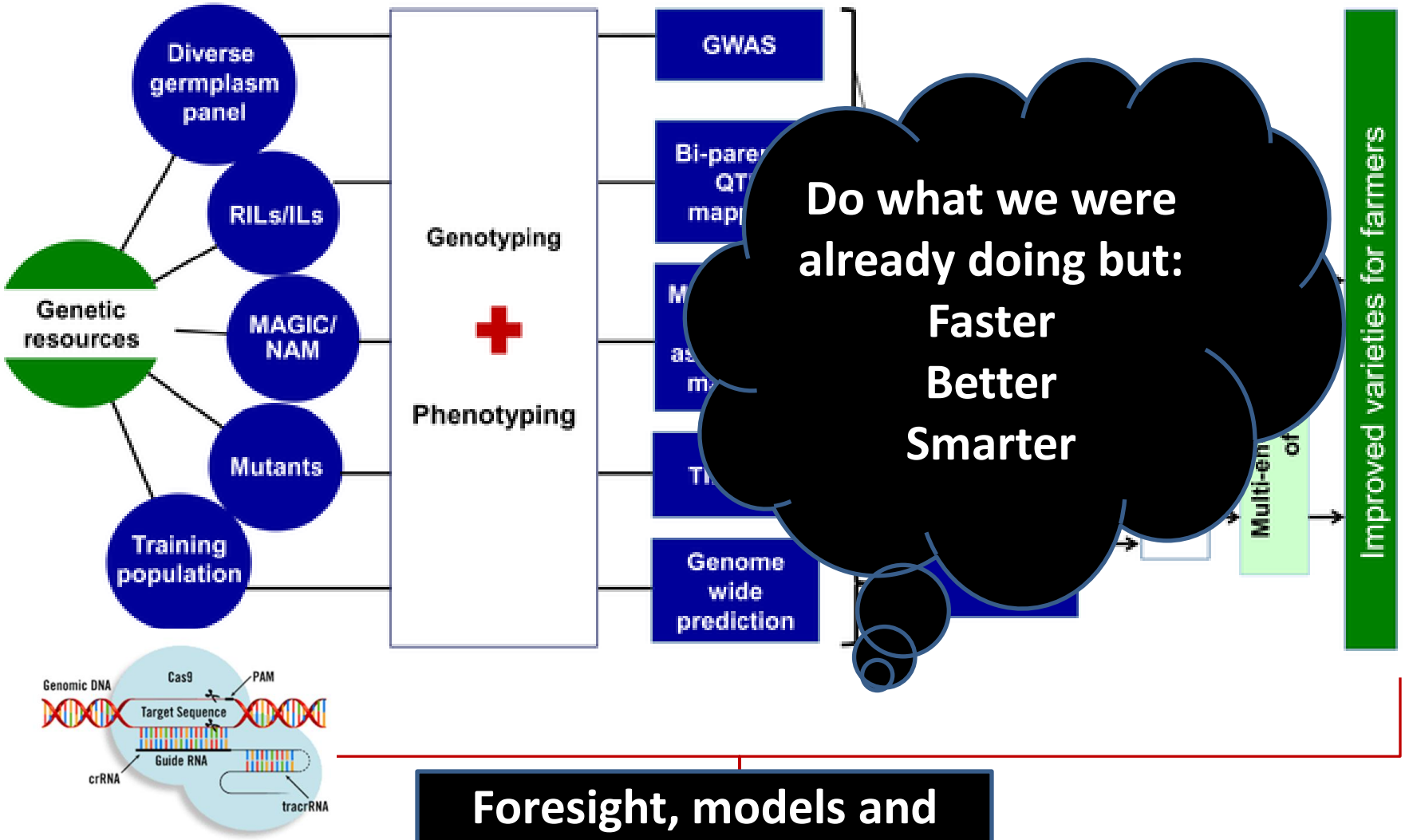
Results

- **Large fraction sweetpotato germplasm heat stress tolerant**
- **305 clones with yields >12.2 t/ha**
- **Considerable genetic variation heat stress**
- **Large pool favorable alleles to heat stress**
- **Large and sustainable genetic gains expected**

Bettina Heider[1], Elisa Romero[1], Raul Eyzaguirre[1], Wolfgang Grüneberg[1], Emile Faye[2], Stef de Haan[1,3] and Merideth Bonierbale[1]
1= CIP, 2=IRD (Institut de recherche pour le développement), 3=CIAT

Mozambican farmers with Irene, the most popular of the country's drought tolerant, orange-fleshed sweetpotato varieties. Photo: B.Rokatoarisoa/CIP

Raising the bar with genomics-assisted climate smart breeding

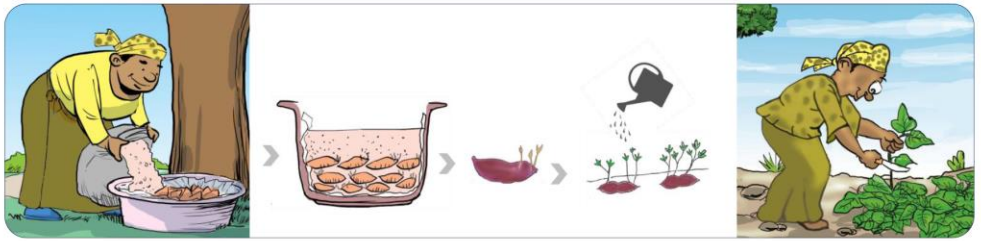


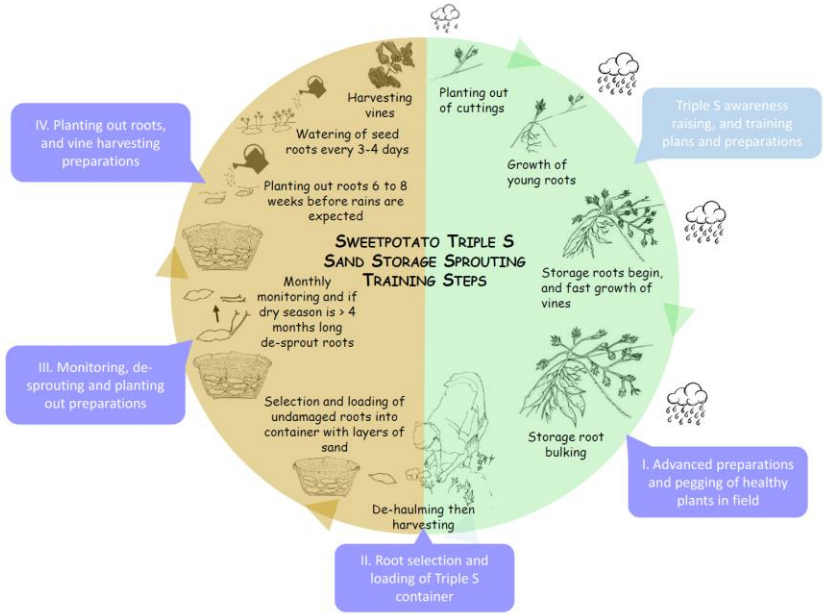
Foresight, models and metrics for climate sensitive breeding

Varshney et al. 2014

Climate proofing seed systems

STORING IN SAND AND SPROUTING SWEETPOTATO TRIPLE S TRAINING CHARTS





These training materials were developed by a team from the Natural Resources Institute (NRI), University of Greenwich, UK and the International Potato Centre (CIP)
Tanya Stathers, Sam Namanda, Sammy Agili, Mihiretu Cherinet, Jude Njoku, Margaret McEwan - 2017

Wrap up

1. Climate change so fast that current technology wont be able to keep up!
2. Foresight to understand drivers of yield loss under climate change
3. Considerable scope adaptation roots and tubers
4. Heat, drought and salinity tolerance complex traits
5. Raise the bar with climate smart breeding – keeping users needs in mind (gender & trait preferences)
6. Embed in broader context - high priority for teaming up!

CGIAR RESEARCH PROGRAM ON Roots, Tubers and Bananas

CIP INTERNATIONAL POTATO CENTER
A CGIAR RESEARCH CENTER

CGIAR RESEARCH PROGRAM ON Climate Change, Agriculture and Food Security

CCAFS